INTAKE MODULE ASSEMBLY

CROSS-REFERENCE TO RELATED APPLICATIONS

[1] The application claims priority to U.S. Provisional Application No. 60/406,820, which was filed on August 29, 2002.

BACKGROUND OF THE INVENTION

[2] This invention relates to intake module assembly for a vehicle engine that forms a complete air path from an air filter to an engine cylinder head within a two-piece shell structure.

[3] Air intake or induction systems are used to conduct air to internal combustion engines. The use of air induction systems has resulted in the need for additional vehicle system components to compensate for certain undesirable side effects generated by the connection of air induction components to the vehicle engine. For example, engine noise is propagated back through the air induction components, which is undesirable. To address this problem, noise attenuation components, such as resonators, have been utilized to reduce these noises.

[4] Another undesirable side effect introduced by air induction components, is that the air that is drawn into the air induction system includes dust, dirt, and other particulate contaminants. These contaminants can clog the engine resulting in poor performance. Air cleaners with filters are used to remove these contaminants from the airflow prior to the air being drawn into the engine.

[5] Further, other components, such as an intake manifold, air duct hoses, throttle components, etc., must also be incorporated into the induction system to achieve proper

engine control and function. These components are traditionally separately formed and attached to each other prior to being attached to a vehicle engine, or certain induction components are first mounted to a vehicle engine with additional components being subsequently attached either to the engine or other induction components as required.

[6] The use of these multiple induction components increases material and manufacturing costs. Further, the assembly of the additional components into the air induction system and/or onto the vehicle engine is time consuming and labor intensive. Thus, it is the object of the present invention to provide a simplified intake module assembly that reduces the overall number of required components, and which can be easily assembled, as well as overcoming the other above-mentioned deficiencies with the prior art.

SUMMARY OF THE INVENTION

[7] An intake module assembly utilizes a two-piece shell structure to form an air path extending from an air filter to an engine cylinder head. A first shell forms a first portion of the air path and a second shell forms a second portion of the air path. A throttle hose portion is supported on at least one of the first or second shells to form a third portion of the air path. The first and second shells are joined together such that the first, second, and third portions together completely form the air path.

[8] The throttle hose portion can be integrally formed as part of the first and/or second shells or can be separately attached to one or both of the shells. The throttle hose portion conducts air to the engine throttle body and into the intake manifold.

[9] In one disclosed embodiment, multiple induction components are formed as part of the first and second shells. Components such as the intake manifold, resonators, and

air filter holder are integrally formed within the first and second shells. Once the shells are joined together to form the intake module assembly, the assembly is easily mounted to the vehicle engine at the cylinder head.

[10] The subject invention provides an improved intake module assembly that reduces the number of required components, resulting in decreased material, manufacturing, and assembly costs. These and other features of the present invention can be best understood from the following specifications and drawings, the following of which is a brief description.

BRIEF DESCRIPTION OF THE DRAWINGS

[11] Figure 1 is an exploded view of an intake module assembly incorporating the subject invention.

[12] Figure 2A is a side view of a lower shell of the intake module assembly of Figure 1.

[13] Figure 2B is a side view of an upper shell of the intake module assembly of Figure 1.

[14] Figure 3A is a first perspective view of the assembled intake module assembly of Figure 1.

[15] Figure 3B is a second perspective view of the assembled intake module assembly of Figure 1.

[16] Figure 4 is a perspective view, partially broken away, of a tube portion of the upper shell of Figure 2B.

[17] Figure 5 is a perspective view of the upper and lower shells of Figures 2A and 2B as assembled.

[18] Figure 6 is an assembled perspective view of an alternate embodiment of an intake module assembly incorporating the subject invention.

[19] Figure 7 is a side view of a tube portion of the embodiment of Figure 6.

[20] Figure 8 is a top view of a throttle body portion of the embodiment of Figure 6.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT

[21] An intake module assembly, shown generally at 10 in Figure 1, includes a lower shell 12 forming a first portion of an induction air path and an upper shell 14 forming a second portion of the induction air path. An air filter support 16 and air filter chamber 18 are formed within the upper shell 14. An air filter 20 is installed within the chamber 18 to remove contaminants from the air prior to entry of the air into a vehicle engine 22. A filter cover 24 is mounted to the upper shell 14 to enclose the air filter 20 within the chamber 18. The cover 24 includes an inlet air duct 26 that draws air in from the external atmosphere.

[22] The lower 12 and upper 14 shells each include at least one resonator portion 28, a zip tube portion 30, and an intake manifold portion 32. When the shells 12, 14 are aligned and joined together, a complete resonator 28 and intake manifold 32 are formed solely between the shells 12, 14. This will be discussed in greater detail below. The shells 12, 14 are preferably formed from molding materials and using molding processes that are well known in the art.

[23] The lower shell 12 includes a mounting interface 34 for attachment to a cylinder head portion 36 of the vehicle engine 22. Sealing rings 38 are also installed at the mounting interface 34, as is known in the art.

[24] A throttle body 40 is mounted to at least one of the upper 14 or lower 12 shells with a plurality of fasteners 42. A connecting throttle hose portion 44 is used to conduct air exiting from the resonator chamber portions 28 to the throttle body 40. The throttle hose portion 44 is either integrally molded with the upper shell 14 or can be separately attached to the shell 14 by welding or other similar attachment methods.

[25] Air flows through the inlet air duct 26, through the filter 20, through the resonator 28 and into the throttle hose 44. Air then flows through the throttle body 40 into the zip tube portions 30, into the intake manifold 32, and finally into the vehicle engine 22 at the cylinder head 36. Thus, the entire air path from the air filter 20 to the engine cylinder head 36 is formed within the upper 14 and lower 12 shells with tube and hose portions 30, 44.

[26] As shown in Figure 2A, the lower shell 12 includes a first intake manifold portion 32a that includes a main intake chamber portion 46a and a plurality of runner portions 48a. The lower shell 12 includes openings 50 that conduct air from the runners 48a into the engine cylinder head 36. The lower shell 12 also includes a resonator chamber portion 28a that is used to attenuate undesirable noises generated during engine operation. A zip tube portion 30a is also formed as part of the lower shell 12.

[27] The upper shell 14 includes a second intake manifold portion 32b with a main intake chamber portion 46b and a plurality of runner portions 48b. When assembled, the first 32a and second 32b intake manifold portions are aligned and joined to form the intake manifold 32 (see Figure 3A). The upper shell 14 also includes a resonator chamber portion 28b and a zip tube portion 30b that are aligned and joined with the resonator chamber portion 28a and zip tube portion 30a of the lower shell 12 to form the resonator 28 and zip tube 30 (see Figures 3 A and 3B).

[28] The zip tube portion 30b of the upper shell 14 includes a mounting interface 50 for the throttle body 40, shown in Figure 4. The mounting interface 50 includes a circular opening 52 surrounding by a mounting flange 54, which includes a plurality of openings 56. The fasteners 42 are received within the openings 56 to attach the throttle body 40 to the intake module assembly 10. An exhaust gas re-circulation (EGR) port 58 is also formed in the zip tube portion 30b of the upper shell 14. An EGR system (not shown) conducts exhaust gases from an exhaust source back into the intake manifold 32, as is known in the art.

[29] The zip tube portions 30a, 30b each include a wide span flange 60a, 60b. The flanges 60a, 60b are aligned at a zip tube attachment joint 62. The flanges 60a, 60b provide increased rigidity and structural integrity at the attachment joint 62, as shown in Figure 5. A structural flange 64, also shown in Figure 5, is formed on the lower shell 14 at the mounting interface 34 to the vehicle engine 22. The flange 64 is formed underneath the openings 50 that communicate with the cylinder head 36. The flange 64 is formed with high rigidity in the lower shell 12 for attachment to the cylinder head 36 with fasteners (not shown) having a locking compound. The benefit of this configuration is that compression limiters are not required.

[30] An alternate embodiment of an intake module assembly 70 is shown in Figures 6-8. This intake module assembly 70 is similar to the intake module assembly 10 discussed above, but includes an integral throttle 72. In this embodiment, the throttle hose 74 is formed as part of the upper shell 14. It should be understood that this integral throttle hose 74 could also be used in the intake module assembly 10 shown in Figures 1-5.

[31] The throttle hose 74 includes an opening 76, shown in Figure 7, into which the throttle 72 is inserted and retained in place. The throttle 72 is a module that includes a throttle blade 78 and support shaft 80, which are positioned in an opening 82 formed within the throttle 72.

[32] The subject invention provides an improved modular assembly for an engine intake system that reduces the number of required components, and decreases material, manufacturing, and assembly costs. Although a preferred embodiment of this invention has been disclosed, a worker of ordinary skill in this art would recognize that certain modifications would come within the scope of this invention. For that reason, the following claims should be studied to determine the true scope and content of this invention.